Redesign of the Dutch Travel Survey: Response improvement

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Summary

Non-response in the Dutch National Travel Survey (Onderzoek Verplaatsingsgedrag - OVG) has been a matter of great concern to Statistics Netherlands in the last years. A continuing downward trend in the response level has resulted in an overall response of less than 35% in 1998.

A task force investigated the possibilities for improvements and recommended performing a test using the integral 'NEW KONTIV DESIGN (NKD)' from Socialdata (Munich). Statistics Netherlands in co-operation with Socialdata tested this design in September 1997 ("Glass House"-project). The NKD resulted in significantly higher response-rates and better coverage of the target population compared to the OVG-design. In March 1998, Statistics Netherlands started implementing the NKD. During 1998, both designs (OVG and NKD) were conducted in parallel.

Developments in the OVG since 1985, results of the NKD-pilot in September 1997 and the first results of the parallel running are the themes of this paper.

Keywords: *transport survey; non-response; survey design; new kontiv design*

1. INTRODUCTION

For some years now, the Dutch National Travel Survey (OVG) has a significant decline in response (table 1). The OVG is a cross-sectional design conducted by Statistics Netherlands continuously every day of the year since 1978. The OVG has a telephonic-postal design. From 1978 until 1984 the data were collected in a face-to-face interview but due to budgetary reasons from 1985 onwards the data are collected during a telephone interview combined with a mail-out / mail-back survey with self-completion questionnaires (Hendrikx, 1988).

The sample is drawn as a stratified sample from the so-called Geographic Basic File. The survey population encompasses the resident population of the Netherlands. The sampling unit is the household. The Dutch Telephone Company adds, where possible, the telephone numbers to the addresses. The sample is spread randomly over all the days of the year. Due to the telephone approach, households with unlisted telephone numbers as well as those without a telephone are excluded from the survey. From 1995 onwards the yearly sample size was expanded from 10,000 households to 60,000 households (net response) resulting in a data file with 600,000 journeys of 150,000 persons per year. The Ministry of Transport and Public Works finances the expansion.

Since 1985 the necessary data are collected with an interview by telephone and a journey-diary sent by post. First the CBS announces the telephone call in advance by an introductory letter. The data collected during the telephone interview (CATI) concern some household details the composition of the household and the vehicle-ownership. After that the diaries are sent by post to the household. Each individual of the household is asked to keep record of all his travel for one day. Besides the information about travel, some personal information is asked such as income, education, and occupation.

If the respondent does not return a completed diary within five days after the interview-day, a first recall with a new diary is set to him. The respondent is asked again to keep a record of all his journeys on a new predetermined interview-day (seven days after the first interview-day). If the respondent refuses again to return a completed diary, a second recall with the request to fill in a new diary on a new predetermined interview-day (fourteen days after the first day) is sent.

The decline of overall response rates (column 5) stems partly from an increasing proportion of unlisted telephone numbers and therefore a declining accessibility of households (column 2). Furthermore, there is a tendency of a reduced willingness to participate (columns 3 and 4). These factors combined resulted in a drop of overall response rates from 51% in 1985 to 35% in 1998. Since for only about 85% of the responding households the collected data are complete, the 1998 response result on the household level was in fact less than 30% of the original sample.

The declining accessibility and rapidly dropping response rates gave rise to serious and increasing doubts with respect to representativeness of the sample and to the comparability of survey results (Van den Brakel, Luppes and Moritz, 1996; De Heer and Moritz, 1997; Moritz and Van Evert, 1998). Parallel to these developments the demand from the side of policy makers for information with respect

to transport and mobility increased. These facts caused Statistics Netherlands, in co-operation with the Ministry of Transport and Public Works, to look for an alternative design that would combine significantly improved response results with enhanced research flexibility.

Table 1. Response rates Dutch National Travel Survey 1985-1998

Year	Telephone % known	Response CATI	Response diaries	Total response
1985	83.0%	75.0%	81.5%	50.7%
1986	82.3%	76.0%	77.9%	48.7%
1987	82.3%	75.5%	77.6%	48.2%
1988	81.7%	75.0%	72.9%	44.7%
1989	81.4%	77.0%	75.6%	47.4%
1990	81.0%	75.4%	73.2%	44.7%
1991	80.9%	75.6%	75.6%	46.2%
1992	78.1%	76.4%	74.6%	44.5%
1993	77.3%	76.2%	73.1%	43.0%
1994	75.4%	72.6%	75.4%	41.3%
1995	75.1%	72.0%	74.6%	40.3%
1996	73.4%	71.1%	73.8%	38.5%
1997	73.8%	69.9%	71.3%	36.8%
1998	72.7%	68.0%	70.2%	34.7%

Preliminary investigations for a new design of the Dutch National Travel Survey resulted in a choice for the German '**NEW KONTIV DESIGN'.** The institute Socialdata in Munich has developed this research design. Statistics Netherlands tested this design in a pilot study supervised by Socialdata in September 1997.

2. PILOT STUDY 'NEW KONTIV DESIGN'

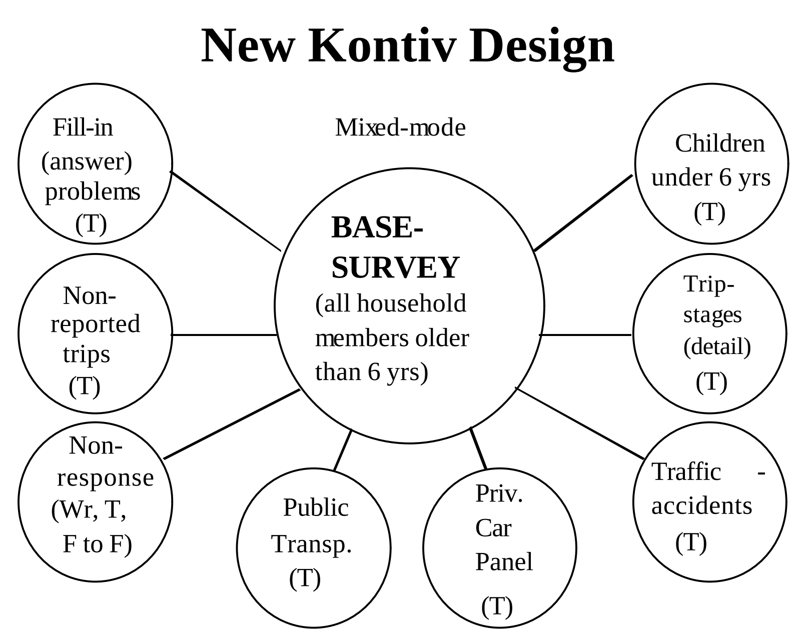
2.1 Plan of the NKD pilot study

The 'New Kontiv Design' has been developed by the institute Socialdata in Munich (a research institute in the field of traffic and infrastructure). This research design has since been implemented successfully in several countries. In September 1997, Statistics Netherlands conducted a pilot study to test this design in the Netherlands. The main objective of the test was to establish whether the required

significant response improvements as compared to the OVG-design would indeed materialize. The NKD is set up as a normal written survey, with a telephonic motivation of respondents and (possible) subsequent follow-up surveys for more detailed data per sub-group. An important advantage of a written survey is that this method of data collection is generally the least burdening for respondents. The respondents are called shortly after they have received the survey material and are motivated to fill in the questionnaire and the diary. The telephone is not used to carry out the survey, but merely as an instrument to motivate the respondents. Only if the required information cannot be obtained otherwise data are collected by telephone (for example when the respondent asks for help).

The basic NKD-survey consists of a written questionnaire for the household and a written questionnaire for each individual within the household. In the latter questionnaire, respondents are asked to report their journeys (activity based) for a specified day. The questionnaire itself is kept as simply as user-friendly as possible, that means as simple as possible. The respondents are not bothered with definitions or questions that would only apply to a small proportion of the population.

Figure 1



The idea is that respondents can answer questions in their own words. Only clear understandable categories for mode and purpose of the trip are given. For example, the NKD-questionnaire gives four purposes (work, education, work-related business and shopping plus return home) and an open space. From these questions a total of 27 categories for purpose are coded, which the respondents report in

their own words. Furthermore, this procedure avoids misunderstandings by the respondents (Brög and Erl, 1999).

Pre-coded answers, explanations or definitions may lead to confusion. The design aims to put the burden on the investigating bureau rather then the respondent. If the data from the received questionnaires are incomplete or require clarification, the correct or additional data are collected by telephone.

If necessary the base questionnaire of the NKD is followed up by several ‘satellite surveys’ (see figure 1) to obtain additional data for specific subgroups (for example children under 6 years of age) and research topics (for example use of public transportation). These satellite-surveys are mostly carried out by telephone, but other methods of data-collection can also be used. In contrast to the OVG design, it can be said that the NKD makes it easy for respondents to co-operate and makes it more difficult to refuse. The NKD is following the starting premise: „The researchers must adjust to the respondents, not the respondents to the researchers“. Although self-evident, this view is often forgotten in the construction of survey designs.

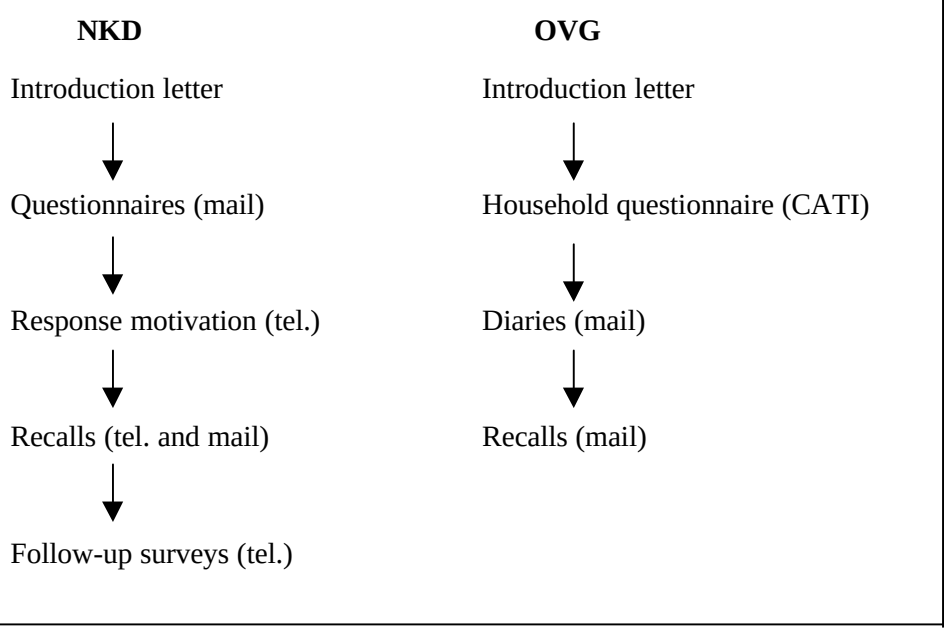
The diary is designed in such a way that the respective trip is defined by the individual activity performed at an out-of-home destination. The basic idea behind the diary design is to obtain all information concerning the out-of-home activities performed, not simply those, which reflect the researcher’s a priori views on what are “formally correct” answers. Correspondingly, the possibility that respondents can report in their own words is regarded as more important than the provision of unclear and therefore confusing concept explanations. The consistent respondent-orientation also results in certain graphic design requirements (e.g. concerning comprehensibility and readability) and dispensing with among other things code symbols in the questionnaire. The technique of using partially structured questions also represents a concession to respondents: all clearly understandable answers can be directly ticked, but the others can be openly stated by respondents in their own words.

Since the respondents best fill diaries out themselves, the carrying out of self-administered surveys is recommended. However, this methodology places the highest demands on the design and manner of carrying out the survey. Because these demands are often not met, it is unjustly discriminated against. In this connection, relevant basic research clearly demonstrates that this survey form is distinctly preferred by the respondents and – when professionally carried out – yields excellent response rates. For all of the mobility surveys on which these studies are based, the survey form preferred by the respondents was determined. This resulted in a clear preference for the mail-back method.

In the pilot study the NKD procedure (see figure 2) was copied meticulously and carried out under supervision of Socialdata. For the NKD-pilot an a-select sample was drawn, consisting of 1000 addresses in three Dutch Provinces (Limburg, Noord Brabant and Gelderland). In the same way, the sample for the control group using the old OVG design (same period and regions) consisting of 1032 addresses was obtained. The samples were drawn from the ‘Geographic Basic Register’ (GBR). After

addresses had been drawn from the GBR the corresponding names and telephone numbers were looked up and added.

Figure 2 PROCEDURES



In the NKD-pilot 5 follow-up surveys were conducted: fill-in problems (T), non-reported trips (T), travel behavior of children under 6 years (T), trip-stages detail of public transport and non-response (handout/mail-back). About 10% of the returned questionnaires were completed/corrected using a telephonic follow-up interview held on the day the questionnaires were received. The same procedure was used to collect data on the travel behavior of children under 6 years, on trip-stage details of the public transport journeys and on non-reported trips.

In comparison with the OVG, the questionnaires and diaries used in the NKD are shorter and easier to read. In addition, no explanatory text, examples or definitions are used in the NKD material. (Because of technical reasons no examples of the questionnaires are printed in this paper. Questionnaires are available at Statistics Netherlands.) The NKD questionnaires are mailed in advance and followed up by a telephone call. In this call, the arrival of the material is verified and respondents are asked if they are willing complete the questionnaire and send it back. This call can also be used to clarify things to respondents. The effect is that respondents are motivated to co-operate. Households without telephone were exclusively approached by mail.

2.2 Results of the pilot

In the pilot study, a response was obtained from 74% of the households that were approached using the NKD procedure (table 2). The response rate in the NKD-pilot was significantly better than the response in the control group using the OVG procedure. For this group, a response was obtained from 44% of the households. This resulted in 70% more diaries. Shown is the so-called „genuine response“, the relation between responding households and the net sample of households. That means sample losses (e.g. invalid household addresses, vacant dwellings, moved away households) are excluded. The difference in sample loss between OVG and NKD is caused by the extra sample loss in the subgroup addresses without listed telephone number in the NKD-pilot. In the OVG survey process these addresses are not contacted, so no extra information is available from these addresses. Unlike the procedure in the OVG-group, in the NKD-group households for which no telephone number could be obtained were approached by mail, resulting in a response rate of 45%.

The higher response in the NKD-group, however, can only partially be explained by this difference. The response for the households for which telephone numbers were known was considerably higher in the NKD-group: 81% versus 55% in the OVG group. The main explanation is that in the OVG group only mail-questionnaires were collected, whereas in the NKD-pilot besides the mail-questionnaires (64%), also telephonic interviews were conducted (17%). Especially elderly and/or non-mobile people are over-repressented in the telephonic interviews. During these interviews the interviewees could be convinced that, despite their age or no mobility on the sample day, their participation in the survey is just as important as for younger or mobile persons. The combination of the mail-back design with the telephonic motivation in the NKD decreases the selective effect with respect to mobility behavior (non-mobile persons) compared to the OVG design.

Table 2. Response rates

	OVG-control*	NKD-pilot
Gross sample size	1032	1000
Sample loss	18	38
Net sample size	1014	960
with telephone	811	765
without telephone	203	195
Responses	446	708
with telephone	446	620
without telephone	-	88
Response rates	44%	74%
with telephone	55%	81%
without telephone	-	45%

* OVG-control-group: same period, region and sample frame as NKD-pilot;

In the OVG-group, 84% of the responding household's data were complete (obtained for all persons in the household). In the NKD-group, the corresponding figure was 90%. Leaving out the households for which a telephone number was not available the percentage of households with 'complete' data this figure rises to 93%.

Shortly after the test period and in addition to the standard procedure of the NKD an extra effort was made to obtain a response in the NKD-group that did not refuse and did not respond during the regular period. In total 97 addresses were re-assigned to field-interviewers. A maximum of three contact attempts was made in a two-week period to contact these addresses. The group consisted of 83 addresses from non-respondent households from the group for which we did not have telephone numbers and 15 addresses from households for which attempted telephone contacts were as yet not successful. This action resulted in an additional 24 responding households.

Table 3. Response by age

Age (years)	OVG-control	NKD-pilot	Population*
0 - 5	8.4%	5.6%	7.3%
6 - 11	8.4%	7.7%	7.5%
12 - 17	6.7%	7.3%	7.0%
18 - 29	14.4%	14.7%	16.2%
30 - 39	17.8%	16.6%	16.5%
40 - 49	15.2%	17.5%	15.2%
50 - 64	19.7%	18.3%	17.1%
65 +	9.6%	12.4%	13.1%

* Same region (1.1.98);

The number of children under six years of age is relatively lower in the NKD-group (table 3). This is caused by the fact that no data were collected for children under six years of age in the households for which a telephone number was not available. Elderly people participate more frequently in the NKD-group.

Another key variable in traffic survey research is the average number of movements per individual per day. In the OVG-group, this figure was with a value of 3.9 considerably higher than the 3.2 in the NKD-group. Methodological effects, over-reporting of trips by changing travel days and the non-response effect of the lower response rate cause that decrease. An over-reporting of trips happens by the replacement of sampling days. This is typical for respondents, who are generally very active, but were for some rare reason (e.g. illness), are immobile on the sample day. They tend to replace the "old sampling day" (in their view) with a "normal sampling day" and thus report a higher mobility. That can easily be checked by the dates for the given and the reported sample day.

An important systematic error in mobility surveys is the effect of different response rates. It is well documented in the respective-literature, that the survey design used, motivates people with a higher mobility to participate in the survey more than those with low or no mobility (e.g. Brög and Meyburg, 1980). In the NKD, a strict mail-back design is used, results can be analysed by the speed of response and following this well-known procedure the results of the NKD could be calculated for the same response rate. Even high mobile people can be better reached by the mail-back methods, as they also get the questionnaire and can make their own decision.

One should keep in mind that different survey designs show different results. However, accompanying method research – as done within this pilot exercise – can identify these effects. So a correction of these effects becomes possible. For example, the OVG-design applied a screening survey in which the interviewees could decide if they would participate in the behavior survey or not. This „self-selection“ show impacts on the behavior, which is regularly underestimated, e.g. higher mobility. In addition, the replacement of sampling days by the respondents results in a higher mobility. Last but not least a higher response rate means that a higher share of less mobile people are participating in the survey.

Another influence could be highlighted in this pilot, which is seldom taken into consideration: the effect of coding, its underlying principles and conventions. CBS and SOCIALDATA did coding by their own standards separately. So the differences could be identified in detail and they had an impact on the results.

2.3 The New OVG

On the basis of the positive experience with the NKD in the pilot study, the Ministry of Transport and Public Works and Statistics Netherlands decided to develop a redesign of the National Travel Survey based on the New Kontiv Design. We will refer to this redesign as the NOVG (New OVG). The redesign required the development of new questionnaires and operating procedures, staying as close as possible to the successful NKD approach. As of the end of February 1998 the NOVG trial commenced. The goal of the trial was to set up and prepare an efficient project organization for the implementation of the NOVG and to get experience with the new procedures and questionnaires.

As Of May 1st, the project-group started to run the final version of the base questionnaire of the NOVG parallel to the old travel survey OVG. Subsequently satellite surveys were developed and implemented in the remainder of the year. Parallel running of OVG and NOVG was continued until the end of 1998. In this way differences in the results of NOVG and OVG can later be quantified in order to correct the existing series (since 1985) for the introduction of the new design. As Of January 1st 1999, the NOVG is fully operational and implemented.

2.4 Test NOVG

From the end of February until May, a test of the NOVG was conducted in co-operation with Socialdata. In consultation with the users of transport survey data, the questionnaires of the NKD-pilot have been adapted. Identical questions to those in the OVG were used as much as possible. An important difference compared to the NKD-pilot was the addition of a question on income. As it was feared that this addition might influence the response negatively, the NOVG-trial sample was split. Half the sample received a questionnaire, which included the income-question, in the other half this question was left out. The results showed no significant impact of this difference in the level of response.

Table 4. Response rates Test NOVG

	with income question	without income question
with telephone	76.5%	76.1%
without telephone	33.3%	35.9%

Conclusions and recommendations from the NOVG test:

- The response in the test run is not quite as high as in the NKD pilot study. This is caused by
  - the NOVG-test stopped prematurely and not all projected recall actions could be carried out, due to the fact that parallel running of the NOVG started
  - households without a known telephone number could not be sent personalized mail
  - National response figures are considerably lower as compared to the test regions of the NKD-pilot. We expect the overall response to increase by several percentage points when the NOVG-design is optimally executed. The target is a 70% response rate.
- The differences between the response results of the sample parts with or without the income question in the base questionnaire are very small. Posing this question does not have a significant effect on the response results. Therefore, it was decided to include this question in the final design of the NOVG-questionnaire. The item non-response to the income question in the NOVG-test was slightly higher compared to the OVG.
- The response for the part of the sample without a known telephone number is much lower compared to the part where households could be called by telephone. We experienced that for the households without telephone response is coming in much slower. To a large extent this is attributed to the difference in procedure. The motivation calls seem to have a strong positive effect on the response results. Two types of measures must be considered. On the one hand, we have to find and implement ways to increase the response for households that cannot be called by telephone. On the other procedures have to be optimized to increase the proportion of households

for which a telephone number can be found. For the NOVG-test, this proportion was as low as 70%.

- Response for the traditional OVG has continued to drop since the NKD-pilot study in September 1997.

2.5 Parallel run of the NOVG

As of the 1st of May the NOVG started to run parallel to the traditional OVG. Unlike the NOVG-trial for the NOVG, the GBA-register was used as the sampling frame. The GBA-register is based on administrative personal registration of all individual citizens in all municipalities. The old sample frame (GBR) is based on all registered post-addresses in The Netherlands. The change of sample frame meant that not only addresses, but also names were known, which facilitated personalized mail. Until the end of 1998 about 1/5th of the sample of the OVG was approached using the NOVG-design. Comparing the results of NOVG with those of the traditional OVG enables us to quantify the effects of the change in survey design. The research results since 1985 of the OVG will be corrected using the results of the design effect study.

The percentage of the sample households for which a telephone number could be obtained has been substantially increased to 80%. As compared to the NOVG-trial, this is in increase of 10%. All households in the NOVG-sample received a questionnaire in which the question on income was included.

Conclusions and recommendations:

- Overall, response levels were better in both sample groups (with telephone about 80%; without telephone over 35%; total response over 71%). The use of a different sample frame (GBA for the NOVG) could well have been an important factor since it enabled to send the questionnaires by personalized mail.
- **Table 5. Response rates per month per mailing**

	With telephone	Without telephone
First Mailing (questionnaires)	42% - 48%	10% - 16%
First reminder	60% - 66%	18% - 23%
Second reminder	71% - 75%	21% - 28%
Third reminder (questionnaires)	76% - 79%	26% - 38%
Fourth reminder	78% - 80%	29% - 40%

- The response level for the part of the sample that could not be approached by telephone falls short of the level that was obtained in the NKD-pilot. This can be explained by the fact that the NKD-pilot was not nation wide, but was held in three southern regions of the country. In addition, the proportion of households for which no telephone number can be obtained is higher in large city areas like Amsterdam, Rotterdam and The Hague. Those cities were not included in the NKD-pilot. Also, the general response level obtained in the large cities is below average. As compared to the NOVG-test the response level for this part of the sample was higher.
- Despite the presence of some factors that could have a negative effect, the overall response is at a comparable level with the response of the NKD-pilot. Those factors are:
  - the NOVG parallel run is carried out nation wide as opposed to the three southern regions in which the NKD-pilot was held
  - the reported period included some feast- and holidays as well as the start of the summer vacation in July.

Looking at the response on a daily basis it seems that days like Ascension Day and the Whiten-weekend do indeed have a negative impact on the response level.

- The extra effort that was put in to find telephone numbers increased the percentage of addresses for which a telephone number was known to 80% of the sample.
- An overall response of at least 70% seems to be attainable.
- Overall costs of the new design (NKD) comparing to the old design (OVG) are about the same.

2.6 Further plans

Since May 1st the NOVG runs parallel to the traditional OVG in a ratio of 2 NOVG on 9 OVG sample units. As from December 1998 the NOVG sample size was increased to the normal sample size. The OVG design was abandoned completely on January 1st 1999. The research results of the OVG for the year 1998 are based upon data obtained using the traditional OVG design (Statistics Netherlands, 1999). The first results of the New OVG will be published May 1st 2000. The OVG results since 1985 will be corrected for the effects of the introduction of the new survey design.

In 1998 satellite surveys are developed for the collection of data on children under six years of age, traffic accidents and the use of public transport.

The research design of the NOVG offers greater possibilities to comply with a specific need for information and to tackle current issues by means additional satellite surveys. As of 1999 the satellite surveys can be expanded on (structurally or incidentally) at the request of the users, for example to collect data on so-called ‘chain-movements’, the use of taxies, long distance movement, mobility of elderly people etc.

3. CONCLUSIONS

Substantially improved response levels

The NKD-pilot of September 1997 produced higher response levels in all respects as compared to the OVG-control group. Total response on the household level is 74% in the NKD-pilot and 44% in the OVG-control group. The number of useful diaries (responding individuals) is 70% higher in the NKD-pilot as compared to the OVG-control group. For the NOVG-test, in the NOVG-parallel run and in the NOVG expanded sample similar good response levels were obtained. Overall costs of the old OVG-design and the new OVG-design are about the same.

Change in composition of the response

The proportion of children under six years of age is lower in the NKD-pilot than in the control group. This is caused by the fact that for part of the sample (+/- 30%) the relevant satellite survey could not be executed by telephone. Asking a telephone number (for unlisted numbers) and/or a mail recall procedure is considered. Elderly people co-operated more often in the NKD than in the OVG design.

The collected data are of comparable quality

Despite the use of simplified questionnaires, a loss of data quality could not be detected. Spread, rounding errors and item non-response are essentially not different comparing the data of the NKD-pilot with the data collected with the OVG-design.

Breach of trend in the mobility data

The proportion of respondents reporting no journeys on the reference day (non-mobile) is higher in the NKD data. The average number of movements per person per day also is lower in the NKD data, even when corrected for the proportion of non-mobile people. In addition, the average distance traveled per person per day is lower in the NKD data. It is clear that the increased proportion of non-mobility that comes with the use of the NKD will cause a breach in the mobility data. Further results of analysis with respect to the collected data of the parallel run will be published separately.

Corrections for trend breaches

For some key variables the use of the new survey design will lead to a breach in the series of mobility data that have been collected since 1985. This is not acceptable to the users of the OVG. Currently the significant differences in research results that exist between the OVG- and the NKD data are being analyzed. The result of this analysis together with the results of similar investigations on the data of the NOVG parallel run will be used to develop a method to ‘correct’ the results of the old OVG. The idea is to find correction factors for the mobility data already collected using the OVG and to compute values for key variables, as they would have been obtained if the NOVG design had used. Thus, the breaches in trends in data series will be smoothed out for key variables. Results of the trend breach correction based on the collected data of the parallel run will be published separately.

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